



Original Communication

Ligature strangulation deaths in the province of Konya (Turkey) ☆

Serafettin Demirci MD (Assist. Prof.)^{a,*}, Kamil Hakan Dogan MD (Assist. Prof.)^a, Zerrin Erkol MD (Prof.)^b, Gursel Gunaydin MD (Assist. Prof.)^a

^a Department of Forensic Medicine, Meram Medical School, Selcuk University, 42080 Konya, Turkey

^b Department of Forensic Medicine, Faculty of Medicine, Abant Izzet Baysal University, 14280 Bolu, Turkey

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ABSTRACT

In the present study, deaths by ligature strangulation in the province of Konya (Turkey) were evaluated from the medicolegal point of view between 2001 and 2006. In total 2850 medicolegal death cases, 161 (5.65%) were resulted from asphyxia and 20 (12.4%) of the deaths due to asphyxia were cases of ligature strangulation. Male:female ratio of the victims was 1:1 with ages ranging from 1.5 to 70 years and a mean age of 37.22 ± 19.28 years. 17 cases (85%) were of homicidal and 3 cases (15%) of suicidal origin. The most widely used ligature material was clothesline in 6 cases (30%). On the examination of neck structures, thyroid cartilage fracture was present in 7 (35%) cases, fracture of the hyoid bone in 3 cases (15%), fracture both of the thyroid cartilage and hyoid bone in 1 case (5%), only ecchymosis in soft tissues in 7 cases (35%). In the paper, the findings determined in our cases are discussed in the light of the literature on the subject.

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1. Introduction

Strangulation is a type of mechanical asphyxia produced by constriction of neck by a force other than the weight of the body.¹ Pressure on the neck may occur by constricting all or part of the circumference of the neck by a ligature. The ligature may consist of a wide variety of objects such as cords, wires, ropes, scarves, ties, towels, stockings, etc.² Strangulation is usually homicidal. Even some authors describe that strangulations should be presumed to be homicidal unless proved otherwise. In order to determine the origin of ligature strangulation, it is necessary to perform a detailed investigation of crime scene and examine the type of ligature on the neck of the victim, the number of wrapping round the neck, the shape of knot and the applied method carefully.^{3,4}

Incidence, methods and underlying motives of strangulation cases may show differences from place to place in relation to age, sex, socioeconomic and cultural factors. In this study, death cases of ligature strangulation in the province of Konya, Turkey were evaluated according to medicolegal aspects.

2. Material and methods

In this study, all the medicolegal death cases, whose autopsies were performed at the Konya Branch of the Forensic Medicine Council of Turkey between 2001 and 2006 were analyzed retro-

spectively. Total 20 death cases of ligature strangulation were evaluated in terms of age, gender, origin, kind of ligature, the place where the corpse was found, the existence of sexual offence, number of ligature marks, localization and number of knots, autopsy findings in neck region and points of forensic importance.

3. Results

It was determined that of 2850 medicolegal death cases occurring between 2001 and 2006, 161 (5.7%) were resulted from asphyxia, and 20 (12.4%) of the deaths due to asphyxia were cases of ligature strangulation. Ligature strangulation deaths accounted for the 0.7% of all the medicolegal deaths.

Ratio of male:female was 1:1. The victims' ages were between 1.5 and 70, and the average age was 37.22 ± 19.28 . It was seen that 17 cases (85%) were homicidal, and 3 cases (15%) were suicidal. The most widely used ligature material was clothesline in 6 cases (30%).

In 8 cases (40%), in which belt, scarf, package line were used as ligature material, there was a single ligature mark, while in 10 cases (50%), in which clothesline, cable, shoelace, and rope were used, more than one ligature marks were detected.

In 2 cases, there were additional closed head trauma findings. 13 cases (65%) were found dead in their houses; whereas 5 cases (25%) in open area; 1 case (5%) in the well; 1 case (5%) in the toilet in the garden. 4 cases (20%), including 2 (10%) children were exposed to sexual offence before strangulation.

It was determined that in the evaluation of the neck structures, there was fracture in the thyroid cartilage in 7 (35%) cases (in one

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* Corresponding author. Tel.: +90 332 223 6752; fax: +90 332 223 6181.

E-mail address: sdemirci@selcuk.edu.tr (S. Demirci).



Fig. 1. Hands and mouth are bound (case 2).



Fig. 2. Strangulation with clothesline, blunt trauma to head (case 2).



Fig. 3. Strangulation with scarf (case 4).

case with ecchymosis in soft tissues), fracture in the hyoid bone in 3 cases (15%), fracture both in the thyroid cartilage and hyoid bone in 1 case (5%), only ecchymosis in soft tissues in 7 cases (35%). In 2 cases (10%) trauma of laryngohyoid complex or soft tissue ecchymosis of soft tissues could not be evaluated due to decomposition. Features of the cases are summarized in Table 1.

4. Discussion

Many vital structures are harbored in close neighborhood in the neck, including blood vessels, nerves, lymphatics, vertebrae, muscles, thyroid and parathyroid glands, esophagus, larynx, and trachea. The head is essentially a ball weighing ~3.6–5.4 kg at the end of a flexible shaft, the neck, and the head and neck must be considered as a single anatomic unit. External neck compression by a hand or ligature can cause fatal mechanical asphyxia through a variety of mechanisms, including airway obstruction, obstruction of jugular venous return, and/or carotid arterial flow, and/or carotid sinus stimulation that might lead to a reflex cardiac death by neural inhibition.^{5–7}

Many factors contribute to the length of time necessary for mechanical interference with respiration to cause death, including the degree of obstruction and force applied by the assailant, the age and sex of the victim, struggling, and the effect of drugs and/or alcohol.^{7,8}

Verma et al.⁴ found the rate of male:female as 3:2 in their death series of strangulation. In our study, this rate was 1:1. These rates indicate that both sexes can be victim for ligature strangulation with equal frequency. In their study, Maxeiner and Bockholdt⁹ studied 66 cases of ligature strangulation and found out that both homicides and suicides are seen more frequently at the age of 45 and over. In our study the mean age was 37.2. Because 3 cases were children in our series, the mean age is lower than reported in the other papers.^{9,11}

Some authors describe that strangulations should be presumed to be homicidal unless proved otherwise.¹² In our study, homicidal ligature strangulations constituted 85% of our casuistics.

When all of the cases evaluated according to the kind of ligature used, in 6 (30%) of the cases clothesline had been used. Besides, a wide variety of other material, e.g. scarf, hosepipe, electric cable, package fiber, rope, pantyhose and belt were used to apply pres-



Fig. 4. Ligature mark (case 4).

sure to the neck. The wide-spread use of clothesline was attributed to the fact that it was easily available.

According to literature, neither using of more than one ligature nor repeated knotting is strongly indicative of a homicidal action. The use of more than one ligature has been reported in suicides as well as multiple turns, up to 20.^{2,9} A single ligature was found in all of our cases.

The assailants, after killing the victims, tried to hide their crimes by disposing the corpses by burning, burying, or hanging, or by throwing them into water or concealing them in distant places in the majority of the cases of fatal strangulation.¹⁰ In our 13 (65%) cases, either crime scenes or the localizations of the places where the corpse were found were domiciles, whereas 5 (25%) victims were left in open areas, 1 (5%) was thrown into the well, and 1 (5%) was burned after the homicide. In the remaining seven cases (35%) found outside of the domicile, the killer had aimed to make the corpse unrecognizable to prevent the corpse to be found.

In homicidal ligature strangulation cases, family quarrels, and sexual assaults were the most common motives behind the murder in females, and personal rivalry in males.¹⁰ Our four cases (20%), two of whom were children, were attacked sexually just before strangulation, which is significant as it emphasizes the need of investigation of possible sexual assault in such fatalities. As in our 17th and 18th cases, the perpetrator particularly tends to kill the victim than hide her/his corpse to prevent the assault from being revealed. In 6 (30%) of our cases, one victim was female and the remaining five were males, the reason of homicide by ligature strangulation was being illegitimate relationship. In these cases, one of the partners in illegitimate relation was murdered by the spouse or the spouse's relatives.



Fig. 5. Scene of death (case 9).



Fig. 6. Ligature mark (case 9).

In the majority of strangulation cases, the ligature is crossed over itself after passing a full circle around the neck – and several turns may be found around, secured with one or more knots. These multiple turns are not uncommon in suicide, where two, three, or even more circles are found around often with complex knots.² In our study, in all of the 3 cases of suicide and in the seven (46.6%) out of 15 homicidal cases, only one ligature mark was present were determined, indicating a single ring. In two homicide cases, ligature mark could not be evaluated because of the advanced decomposition and the getting skeleton.

Analysis of the literature data showed that the localization of the knot in suicidal ligature strangulation cases was often at the anterior region of the neck.^{13–17} But knots localized at the lateral neck region or at the back of the neck have also been reported.^{13,18} In the 2 (66.7%) out of three suicide cases the knot was in the front of the neck. In one of them where tourniquet method was used the knot was at the lateral neck region. In five (33.3%) cases among 15 of homicides, where the knot place was determined, the knots were in the front, and in 10 (66.7%) cases, at the back of the neck. These findings indicate that in homicidal ligature strangulation cases, the knot can be seen more commonly on the back of the neck.

More than one knot in suicides is not unusual.^{2,11,14,17} Our 2 suicidal death cases, had three knots each, whereas in one case, there were 2 knots. In the 15 homicidal cases where the number of knots were determined, 3 (20%) cases had one knot, whereas 12 (80%)

had two or more knots. In our series, it was found out that both in suicides and in homicides (except 3 cases), there were more than one knots. We think that this observation may not always help to determine the origin. Also the question whether the victim could reach the knot alone or not is clearly a fundamental one and must be taken into consideration.

In a study, Rothschild and Maxeiner¹¹ reviewed in detail 116 suicidal ligature strangulation cases. They found that the number of laryngohyoid fractures generally was low, and the involvement of the hyoid bone as well as major injuries (e.g. a fracture of the cricoid cartilage) was extremely uncommon. Fractures of the hyoid bone or the laryngeal cartilages are rarely found in suicidal cases, and are restricted to only one broken upper thyroid horn in most instances. Maxeiner and Bockholdt⁹ analyzed 47 homicidal and 19 suicidal death cases by ligature strangulation. They reported bleeding on the tongue in 25 homicide and 19 suicide cases whereas injury in laryngohyoid complex was present in 21 homicide and 2 suicide cases. Sharma et al.¹⁹ reported that there were fracture of hyoid bone in 3 (37.5%) and fracture of thyroid cartilage in 4 (50.0%) of 8 ligature strangulation cases. In our study, there was a fracture on the left upper horn of thyroid cartilage with ecchymosis in soft tissues in just one suicide case (case 15). Fracture in the thyroid cartilage in 6 (40%) cases; fracture in the hyoid bone in 3 (20%) cases; fracture both in the thyroid cartilage and hyoid bone in 1 (6.7%) case; mere ecchymosis in soft tissues in 5 (33.3%) cases were found in a total of 15 homicidal deaths. In 2

Table 1

Features of the cases.

No.	Age	Gender	Origin	Kind of ligature	Localisation of corpse	Sexual offence	Number of ring(s)	Localization of knot	Number of knot(s)	Autopsy findings in neck region	Other specialities
1	35	F	Homicide	Package line	Open area	–	1	Post.	1	Ecchym. in soft tissues	Burned – unknown perpetrator
2 ^a	65	M	Homicide	Clothesline	House	–	3	Post.	3	Fracture of hyoid bone	Hands-feet-mouth are bound (Usurpation) (Figs. 1 and 2)
3	60	M	Homicide	Electric cable	House	–	4	Ant.	2	Fracture of hyoid bone	Illegitimate relationship
4	1.5	F	Homicide	Scarf	House	–	2	Post.	2	Ecchym. in soft tissues	Illegitimate baby (Figs. 3 and 4)
5	30	F	Homicide	Belt	House	–	1	Post.	1	Fracture of HB + TC	Perpetrator was husband with mental disorder
6	25	F	Homicide	Scarf	House	+ ^b	1	Post.	2	Fracture of hyoid bone	Prostitute-unknown perpetrator
7	45	M	Homicide	Clothesline	Toilet	–	3	Post.	1	Ecchym. in soft tissues	Unknown perpetrator
8	38	M	Homicide	Clothesline	House	–	5	Ant.	3	Fracture of thyroid cart.	Illegitimate relationship
9	28	M	Homicide	Shoelace	Open area	–	2	Ant.	2	Ecchym. in soft tissues	Illegitimate relationship (Figs. 5 and 6)
10	35	M	Homicide	Rope	Open area	–	2	Post.	2	Ecchym. in soft tissues	Illegitimate relationship (Fig. 7)
11 ^a	38	M	Homicide	Scarf	House	–	1	Post.	2	Fracture of thyroid cart.	Usurpation of brother
12	27	F	Homicide	Clothesline	House	–	1	Post.	2	Fracture of thyroid cart.	Illegitimate relationship
13	68	M	Suicide	Belt	House	–	1	Lat.	2	Ecchym. in soft tissues	Tourniquet method-depression
14	70	F	Suicide	Pantyhose	House	–	1	Ant.	3	Ecchym. in soft tissues	Asthmatic bronchitis-depression
15	30	F	Suicide	Scarf	House	–	1	Ant.	3	Fracture of thyroid cart. + Ecchym. in soft tissues	Schizophrenia
16	45	M	Homicide	Clothesline	Well	–	3	Post.	4	Fracture of TC + Decomposition findings	Illegitimate relationship
17	9	F	Homicide	Hosepipe	Open area	+ ^c	–	–	–	Decomposition findings	Pedophile perpetrator
18	10	F	Homicide	Clothesline	Open area	+ ^c	–	–	–	Decomposition findings	Pedophile perpetrator
19	30	F	Homicide	Scarf	House	+ ^b	1	Ant.	2	Fracture of thyroid cart.	Prostitute
20	55	M	Homicide	Electric cable	House	–	1	Ant.	2	Fracture of thyroid cart.	Procurer-unknown perpetrator

F: female, M: male, HB: hyoid bone, TC: thyroid cartilage.

^a Additional lethal blunt trauma to head was determined with ligature strangulation.

^b Genital swabs were positive for semen and the perpetrator was identified through DNA analysis.

^c The perpetrator who killed two children (cases 17 and 18) confessed that he had raped them anally. As decomposition was present, ano-genital trauma could not be determined.



Fig. 7. Strangulation with shoelace (case 10).

(10%) of our cases, we couldn't determine any fracture or soft tissue injury in the laryngohyoid complex due to decomposition. In our homicidal ligature strangulation cases, more injuries were determined in the laryngohyoid complex in consistency with the findings in the literature.

As a result, in death cases due to ligature strangulation, there are many medicolegal problems to be solved. A detailed crime scene investigation and a systematic autopsy are required. Sexual assault or an illegitimate relation must be investigated. The possibility of ligature strangulation should be kept in mind in cases of burned corpses or in cases of corpses left in open areas.

Conflict of interest statement

None.

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